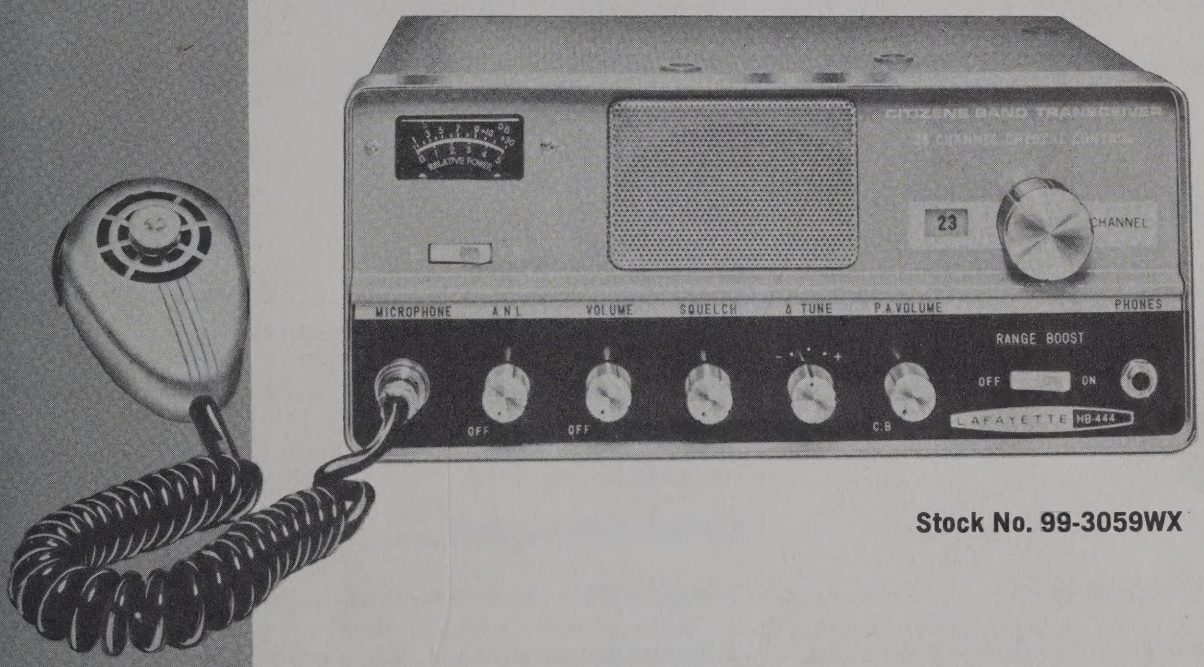
LAFAYETTE®

Model HB-444



Stock No. 99-3059WX

23-CHANNEL CB TRANSCEIVER

INSTALLATION AND OPERATING MANUAL

LAFAYETTE RADIO ELECTRONICS

SPECIFICATIONS

RECEIVER

CIRCUIT TYPE ..... Dual conversion superheterodyne; crystal-controlled 23 channel reception with crystal-controlled "fine tuning" capability of ±2.5 Kc on each channel. 14 crystals used in a frequency synthesized circuit to provide 23 channel operation on transmit and receive.

SENSITIVITY ..... 0.3 μv for 6 db S + N to N ratio at 30% at 400 cps modulation.

SELECTIVITY ..... 6 db bandwidth: ±2 Kc; 31 db bandwidth: ±8 Kc.

INTERMEDIATE FREQUENCY ..... 1st IF 6.2 Mc, 2nd IF 455 Kc.

AUDIO OUTPUT ..... 4 watts into 5" x 3" oval speaker.

AUXILIARY CIRCUITS ..... PA Function (with volume control), Adjustable Noise Limiter, Adjustable Squelch.

TRANSMITTER

PLATE POWER INPUT TO FINAL ... 5 watts or 100 milliwatts, switchable.

MODULATION ..... AM, via plate modulation; up to 100% capability.

RANGE-BOOST ..... Yields high average modulation at all times at average speaking levels.

HARMONIC SUPPRESSION ..... Exceeds FCC requirements.

FREQUENCY DRIFT ..... Exceeds FCC requirements of ±.005%.

ANTENNA MATCHING ..... Will match resistive antenna loads of 50-75 ohms.

TRANS/REC SWITCHING ..... All electronic circuitry (no relays), push-to-talk on microphone.

TUBES & SEMI-CONDUCTORS

		Receiver	Transmitter
V1	6CW4	RF Amp	-----
V2	6CW4	1st Mixer	-----
V3	12AT7	2nd Mixer, 2nd Osc.	-----
V4	6BA6	IF Amp (455 Kc)	-----
V5	6BA6	IF Amp (455 Kc)	-----
V6	6BA6	IF Amp (455 Kc)	-----
V7	12AX7	1st Audio, Squelch	-----
V8	6BQ5	Audio Output	Modulator

PRINTED IN U.S.A. • ENTIRE CONTENTS COPYRIGHTED 1965 BY LAFAYETTE RADIO ELECTRONICS CORPORATION • 111 JERICHO TURNPIKE, SYOSSET, L. I., N. Y.

V9	12AX7	------	Mic Preamp, Range-Boost
V10	6AN8	Local Oscillator, Synthesizer	
V11	6BE6	------	Converter
V12	6CB6	------	Buffer Amp
V13	6BQ5	------	Power Amp
D1	1N60	Det, AGC	-----
D2	1S180	ANL	-----
D3, D4	1N46A	------	Range-Boost
D5, D6	1N34	Meter Rect ("S" reading)	Meter Rectifier (RF power)
D7, D8	5GL	Full-wave Rectifier (voltage doubler)	
N1, N2	NE68A	Neon Voltage Regulators	

COMMON

POWER SUPPLY ..... 105-125 volts, 50/60 cycles AC or 11.5-14.5 volts DC.

POWER CONSUMPTION ..... 90 watts on 117 volts AC, 4 amps (receive), 4-1/2 amps (transmit) on 12 volts DC.

DIMENSIONS ..... 12" W x 5" H x 10" D (including knobs and plugs at rear).

NET WEIGHT ..... 17 lbs.

SHIPPING WEIGHT ..... 20 lbs.

ACCESSORIES .....
(1) Push-to-talk ceramic microphone with coil cord and 4-pin connector.
(2) 117 volts AC power cable.
(3) 12 volts DC power cable (fused for 8 amps).
(4) FCC License Application Form 505.
(5) Part 95 of FCC Rules and Regulations.
(6) Form 452-C Identification Card.
(7) Mounting Bracket.

GENERAL INSTRUCTIONS

The Lafayette Model HB-444 Transceiver is a combination transmitter and receiver designed for use in Class "D" operation in the 11 meter citizens radio service. It is designed to meet the Federal Communications Commission requirements applicable to equipment operating in this service under class "D" emission, and not to be used for any other purpose. Rules Part 95 of the FCC regulations defines operation in this service and the licensee is required to read and understand these regulations prior to operating a CB transmitter. Copies of Manual VI (covering the FCC regulations for the Citizens Band Radio Service) includes Part 95 and are available for $1.25 from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. A station license may be obtained by submitting a properly completed Station License Application, Form 505 as directed.

It is illegal to operate the transmitter section of this transceiver prior to receiving a valid station license and "call sign". NOTE: It is the transmitter that is licensed, NOT the operator. Anyone may operate a properly licensed CB transmitter but the licensee will be held responsible for any violations incurred during use.

A properly completed Identification Card FCC Form 452-C must be attached to the transmitter. The HB-444 will provide economical and reliable radio communication in its intended application if installed and operated in accordance with instructions contained herein.

GENERAL DESCRIPTION

RECEIVER SECTION

The receiver is designed to receive amplitude modulated signals in the 26.965 to 27.255 Mc (11-meter) citizens band. The circuit is a highly sensitive and selective dual-conversion superheterodyne type, with a low-noise Nuvistor RF amplifier and 1st Mixer. The unit employs a frequency-synthesized circuit in which 14 crystals (all supplied) are used to provide full 23 channel crystal-controlled operation (receive and transmit), switch selected from the front panel. The HB-444 is equipped with an 11-pin socket at the rear of the chassis which offers direct plug-in facilities for the Lafayette Priva-Com Selective Call unit.

Features incorporated into the receiver section include an S-meter for reading signal strength, an adjustable noise limiter which provides varying degrees of noise limiting action, and an adjustable squelch control which can be used to "quiet" the receiver when no signal is being received. As a further aid to better reception, the circuit includes a 3-position Delta Tuning Switch that offers "fine tuning" of plus or minus 2.5 Kc on receive. This feature, which is crystal-controlled, permits optimum reception of stations that are slightly off frequency.

TRANSMITTER SECTION

The transmitter is designed to transmit amplitude modulated signals in the 26.965 to 27.255 Mc (11-meter) citizens band. The frequency synthesized circuit used for receive is also common to the transmitter and used in the transmit mode to provide full 23 channel crystal-controlled operation. A push-to-talk button on the ceramic microphone (supplied) offers convenient and reliable electronic switching. Plate modulation is employed (100% capability), with 5 watts maximum plate power input to the final RF, and up to 3 watts of RF carrier to the antenna. Also included is a special "Range-Boost" circuit which, when "on", concentrates more audio power into the sidebands by providing maximum modulation on all syllables. This feature offers maximum communication distance when noisy conditions make reception of your signal difficult. A relative RF power meter (which functions as an S-meter on receive) indicates relative RF power at the antenna. A special switch at the rear of the transceiver allows a choice of either full 5-watt operation or 100 milliwatt operation, as desired. An added feature is a provision for public address, utilizing the microphone and audio circuits to feed an external speaker connected to the Phones output jack.

POWER SUPPLY

The transceiver is designed to operate from either 105-125 volts, 50/60 cycles AC or 11.5 to 14.5 volts DC. Two power supply cables are supplied -- one for AC operation, the other for DC operation. All that is required is that the appropriate power cable be plugged into the 8-pin power socket in the transceiver. On 12 volts DC operation, the transceiver employs a built-in solid-state power supply circuit.

BASE STATION INSTALLATION

The transceiver should be placed in a convenient operating location, close to an AC power outlet, suitable ground and the antenna lead-in cable.

MICROPHONE BRACKET INSTALLATION

The microphone bracket may be installed on the left or right side of the transceiver in one of the two positions shown in Figure 1. The position that must be used will depend on the position of the "Vari-Tilt" mounting bracket. If it is not used at all (as is possible in a base station installation), the microphone bracket may be installed in position 1 or 2, whichever is more convenient.

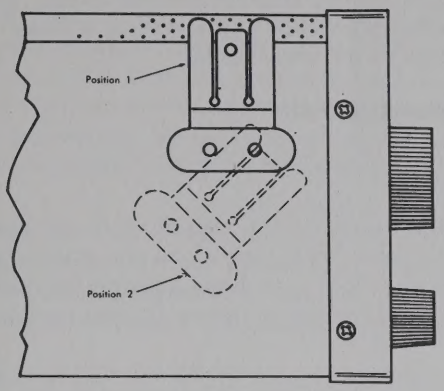


Figure 1 Microphone bracket installation. Bracket may be attached to either side of the transceiver. If desired, the bracket may be attached in any other convenient location (car dashboard, etc.).

If the mounting bracket is attached to the top of the transceiver (as would be normal in a car installation), it will be necessary to use position 2. If the mounting bracket is attached to the bottom of the transceiver, it will be necessary to use position 1.

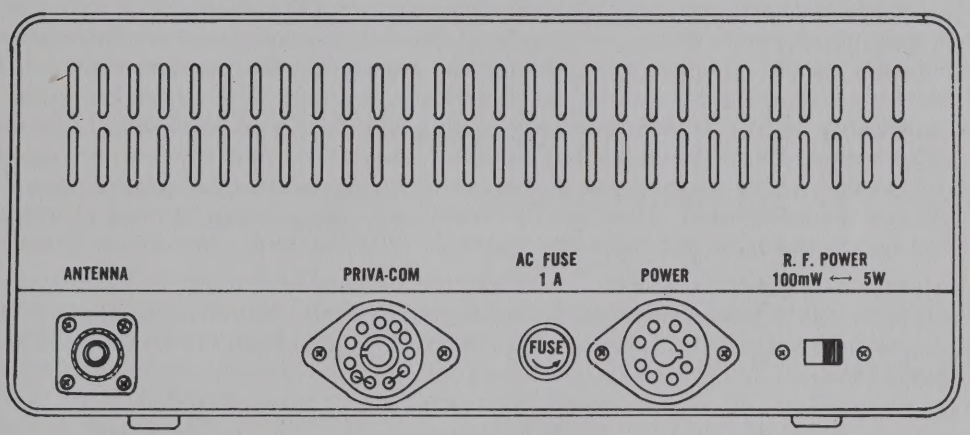


FIGURE 2.

AC POWER CONNECTION

Select the AC power cord and attach the 8-pin female connector to the 8-pin male connector at the rear of the transceiver. CAUTION: Always line up the keyway properly before pushing the cable connector onto the transceiver. Do not attempt to force the connector onto the pins -- when properly lined up, the connector will slip on easily. Making sure the transceiver is off (switch is located at the extreme counter-clockwise of the VOLUME control), insert the AC plug at the other end of the cord into an outlet supplying 105-120 volts, 50/60 cycles AC. For protection, the AC input to the transceiver is fused (rear of transceiver).

MICROPHONE CONNECTION

Attach the 4-pin male connector at the end of coil cord to the 4-pin female connector at the lower left front of the transceiver. Secure it firmly by means of the knurled securing ring. Note: the receiver will not operate without the microphone connected.

ANTENNA CONNECTION

The antenna lead-in cable (RG-58/U or RG-8/U) should be terminated with a PL-259 type male coaxial connector which should then be attached to the matching female connector at the rear of the transceiver.

For short-range communications work, the Lafayette antenna model HE-19 may be used. This antenna is designed for direct connection to the transceiver without lead-in cable and is a base-loaded vertical whip that extends to 45" (Lafayette Stock No. for HE-19 is #99-3015).

MOBILE INSTALLATION OF TRANSCEIVER

MICROPHONE BRACKET INSTALLATION

The microphone bracket may be installed on the left or right side of the transceiver in one of the two positions shown in Figure 1. The position that must be used will depend on the position of the "Vari-Tilt" mounting bracket. If it is not used at all (as is possible in a base station installation), the microphone bracket may be installed in position 1 or 2, whichever is more convenient.

If the mounting bracket is attached to the top of the transceiver (as would be normal in a car installation), it will be necessary to use position 2. If the mounting bracket is attached to the bottom of the transceiver, it will be necessary to use position 1.

TRANSCEIVER INSTALLATION

Before installing the transceiver in a car, truck, boat, etc., be sure to choose a location which is convenient to the operating controls, and will not interfere with the normal functions of the driver. The transceiver may be mounted to the underside of the instrument panel or dashboard of a car, truck, etc., by means of the special bracket that is supplied with the transceiver. Remove the bracket from the transceiver by loosening the four large knurled screws at the sides. Attach the bracket to the underside of the instrument panel using the four self-threading screws provided. Figure 3 shows the various ways in which the bracket can be mounted to suit the particular location. Secure the transceiver to the bracket by means of the large knurled side screws.
Note that the bracket has additional holes for the front pair of securing screws to allow the transceiver to be set to an angle which provides the operator with the best view of the front panel.

CAUTION: This transceiver is designed for use only in vehicles employing a negative ground system. DO NOT USE IN POSITIVE GROUND VEHICLES.

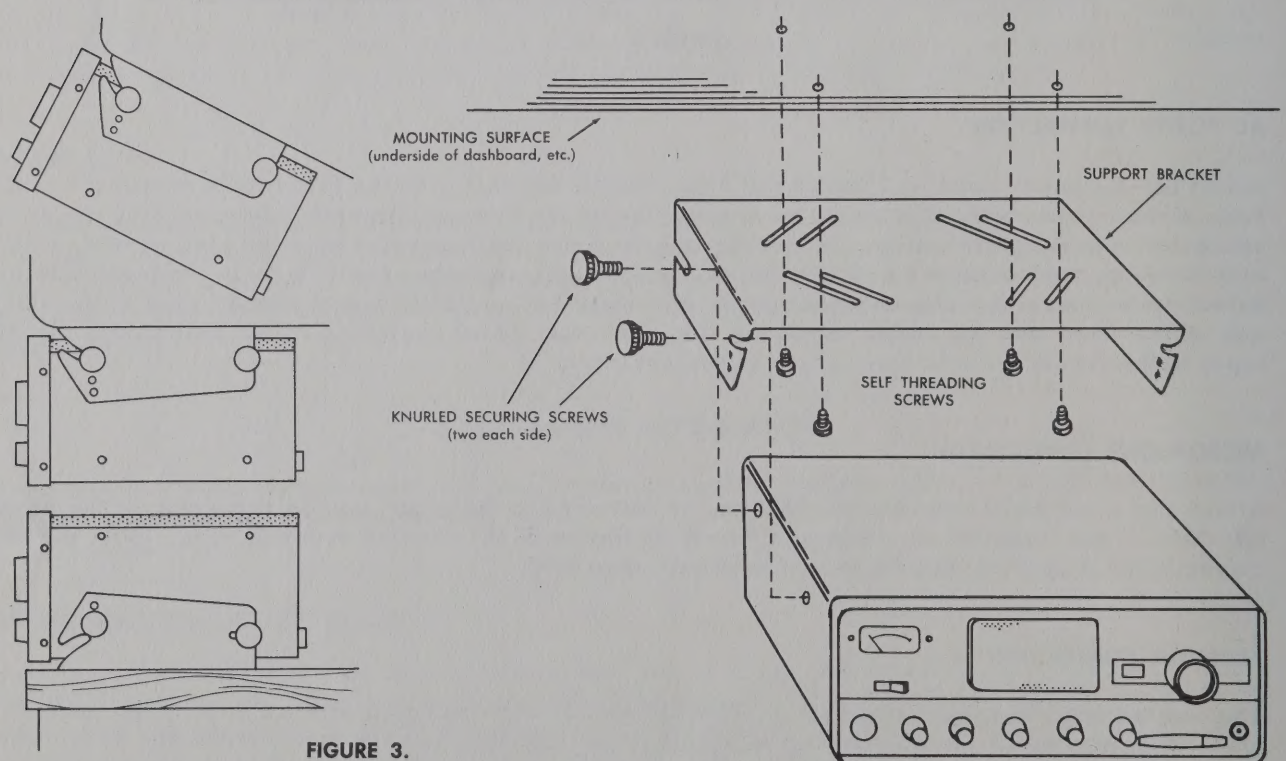


FIGURE 3.
MOBILE INSTALLATION OF THE-TRANSCEIVER

The Red lead in the DC power cable (this is the lead that is fused for 8 amps) should be connected to the main positive battery source in the vehicle. "Hot" points normally available are the accessory post on the ignition switch or the accessory side of the fuse block. The Black lead should be connected to the metal firewall or any other point that is connected to the vehicle chassis (negative battery potential). Make sure the Red lead has been connected to a point which provides power only when the ignition switch is turned on.

The BLACK lead should be connected to a good metal ground in the vehicle. If installed in a boat, the transceiver will not operate at maximum efficiency without a ground plate, unless the vessel has a steel hull. However, before installing the transceiver, consult a qualified marine technician regarding an adequate grounding system.

As a final step, the 8-pin female connector at the other end of the power cable should be attached to the 8-pin male connector at the rear of the transceiver. CAUTION: Always line up the keyway properly before pushing the cable connector onto the transceiver. Do not attempt to force the connector onto the pins -- when properly lined up, the connector will slip on easily.

IMPORTANT. The solid-state (2-transistor) DC power supply circuit is designed to operate within an input voltage range of 11.5 to 14.5 volts DC. To avoid possible failure of the transistors, you should make sure that the vehicle supply voltage does not exceed 14.5 volts at any time. If necessary, adjust the voltage regulator to cut out at this voltage (14.5).

ANTENNAS

The results obtained with your new Lafayette Citizens Band Transceiver will be greatly determined by the efficiency of the antenna system used.

Due to the complexity of the subject, it is not within the scope of this manual to provide detailed information on antenna systems. Although this section does contain some general information which may be of value to the beginning CB enthusiast, we suggest you purchase one of the numerous books available which covers this subject in greater detail. The Howard W. Sams publication by David E. Hicks, "CB Radio Antenna Guidebook", is particularly recommended. This book offers a complete guide to the selection and installation of CB antennas and includes a great deal of information that will be useful in obtaining optimum results with your antenna system.

ANTENNA CABLE

For optimum results in a mobile installation, the length of the RG-58/U 50 ohm coaxial cable should be 11 ft. 9 inches, or multiples thereof (23 ft. 6 inches, etc.). Lengths other than multiples of 11 ft. 9 inches may be used when perfect antenna matching exists. However, this ideal condition is generally difficult to obtain because of a number of factors which affect impedance, such as the type of antenna, its tuning, its height above ground, and the transmission line employed.

When the use of the particular lengths specified results in an over-long line, the excess should be wound in a neat coil not less than 8 inches in diameter.

In a base station installation, an exceptionally long lead-in cable may be required. When lengths of over 50 ft. are necessary, RG-8/U coaxial cable is more suitable since it offers lower loss than RG-58/U.

MOBILE ANTENNAS

The type of antenna best suited for mobile service is a vertically polarized whip antenna. The vertical whip is non-directional and can be of the loaded type (top, center or base loaded), or a full quarter-wave, the latter usually being more efficient. Both types use the metal body of the vehicle as a "ground plane". There are a number of locations that may be used for the installation of an antenna on a car. Four of the most popular locations are those shown in Figure 4.

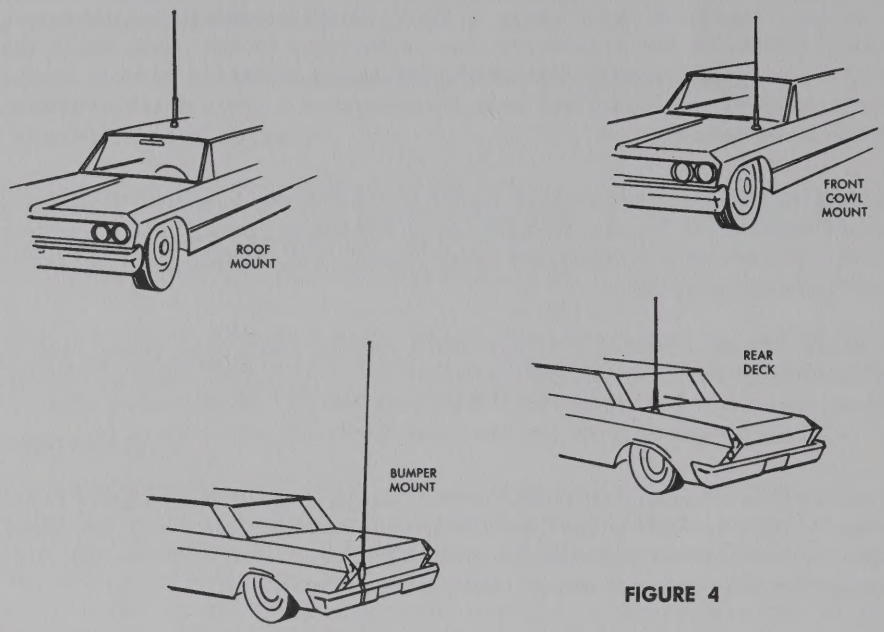


FIGURE 4

FRONT COWL MOUNTING

Front cowl mounting offers a number of advantages. The CB antenna can be mounted in place of the regular auto radio antenna and will thus provide the minimum of installation problems. The antenna can then be used for both the CB and standard auto radio by employing any of the commercially made two-way couplers available (such as the Lafayette HP-202, Stock #42-0903). In this location you can install a short loaded whip, with only a small loss of efficiency.

The horizontal radiation pattern in such a location is slightly irregular, radiation being slightly greater in the direction of the rear fender opposite to the side on which the front cowl antenna is mounted.

ROOF MOUNTING

Roof mounting is usually the best location because it provides an almost perfect omnidirectional radiation pattern. However, the use of a full 108-inch quarter-wave antenna on the roof of a vehicle is fairly impracticable and a shorter loaded whip is usually installed in this location, even though this type offers lower efficiency.

REAR DECK MOUNTING

Rear deck mounting permits the use of a full quarter-wave antenna or a shorter, loaded whip. The radiation pattern in such a location is somewhat irregular, radiation being slightly greater in the direction of the front fender opposite to the side on which the rear deck antenna is mounted.

BUMPER MOUNTING

This arrangement uses the rear bumper of the car and is by far the most practical for use with full 108-inch quarter-wave whips. Another advantage is that removal of the antenna is simple and leaves no holes in the car body. The radiation pattern produced by an antenna mounted on the left rear bumper is fairly irregular, with greatest radiation being in two directions -- one to the right and forward slightly, the other to the rear and left slightly.

BASE STATION ANTENNAS

SHORT RANGE

The Lafayette HE-19 (Lafayette Stock No. 99-3015) is a small base loaded whip designed for short range communications work -- intercommunication between buildings, etc. It mounts directly in the back of the transceiver. Extended -- it measures 45", closed -- 15".

LONG RANGE

There are three basic types of long-range antennas as shown in Figure 5.

A. Vertical Ground Plane Antennas. These are omnidirectional antennas that provide optimum performance for contacting other fixed stations using vertical type antennas in addition to all mobile stations. For medium and long range communications work.

B. Coaxial Antennas. These are high efficiency type radiators with omnidirectional characteristics, performing as well in most applications as the ground plane type. Ideal for those installations where a vertical ground plane is not feasible. For medium and long range communications work.

C. Directional Beam Antennas. Highly efficient and directional antennas generally intended for fixed-to-fixed long range communications. An average 3-element beam provides an equivalent of 8 db increase in transmitter power.

FIGURE 5.

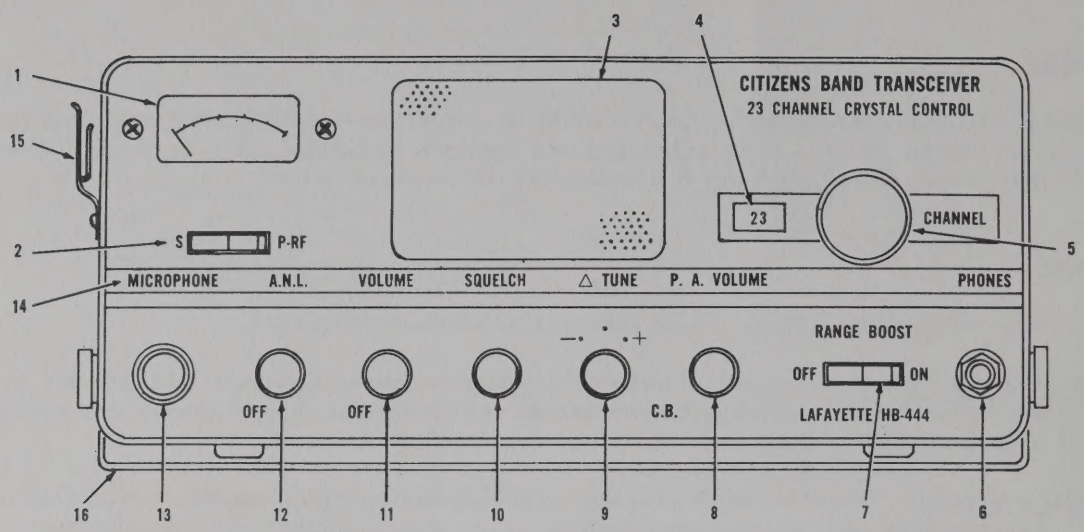
TV INTERFERENCE SUPPRESSION

The transceiver contains a highly efficient filter that suppresses all spurious signals well below the prescribed FCC limits at the time of manufacture. In the event of TVI, it may be necessary to use an additional low pass filter (Lafayette Stock No. 42-0123), connected between the transmission line and unit. A high pass filter (Lafayette Stock No. 99-4009) installed at the TV set may also help.

IGNITION INTERFERENCE

AUTO

The suppression carried out on vehicles equipped with a standard broadcast radio will usually prevent any serious ignition interference from occurring. However, because of the high sensitivity of the receiver in the HB-444, sufficient noise may be picked up from your own vehicle to make reception of weaker stations difficult. In such a case, additional suppression is recommended. Several noise suppressor kits are available (such as the Lafayette HP-204, Stock No. 42-0905) which include all necessary parts and instructions for effectively suppressing ignition noise. Alternatively, you can take the vehicle to a skilled auto radio technician who will be able to carry out the suppression for you.



OPERATING CONTROLS AND FEATURES

(1) INDICATING METER ..... Illuminated meter indicates relative strength (in "S" units) of incoming signal or RF antenna power (in watts) of the transmitter, depending on position of switch beneath.

(2) METER FUNCTION SWITCH ..... Operates in conjunction with meter above.

(3) SPEAKER ..... PM-type 5 x 3" oval speaker located behind grille.

(4) CHANNEL INDICATOR ..... Illuminated dial shows channel to which the transceiver is set.

(5) CHANNEL SELECTOR ..... Continuously rotating switch that selects any one of 23 CB channels for transmit and receive operation.

(6) PHONES ..... Standard phone jack for headphones or external speaker (3-4 ohms). Insertion of plug into the jack automatically silences the internal speaker.

(7) RANGE-BOOST ..... Concentrates more audio power into the transmitted sidebands by providing high average modulation on all syllables. Offers maximum communication distance when noisy conditions make reception of your signal difficult.

(8) PA VOLUME ..... Switches transceiver to Public Address mode and provides volume adjustment.

(9) DELTA TUNE ..... 3-position switch (-2.5 Kc, Normal +2.5 Kc) which permits "fine" tuning for reception of stations that are off frequency.

(10) SQUELCH ..... This control is used to "quiet" the receiver during "no-signal" conditions. Degree of sensitivity to incoming signals is adjustable.

(11) VOLUME/ON-OFF..... Varies the sound output from the speaker during CB reception. Also incorporates an on-off power switch at the extreme counter-clockwise position.

(12) ANL ..... Automatic noise limiter for the reduction of ignition and other man-made noise. Variable control permits the operator to adjust for optimum limiting action under differing noise conditions.

(13) MICROPHONE ..... Four-pin socket for attachment of push-to-talk ceramic microphone (supplied).

(14) ILLUMINATED PANEL STRIP ..... Glows softly when unit is switched on and illuminates all control designations -- perfect for identifying all controls at night.

(15) MICROPHONE CLIP..... Hang-up clip for microphone (supplied separately for installation in various positions).

(16) "VARI-TILT" BRACKET..... Specially designed mounting bracket simplifies mobile installation--also permits fast removal of transceiver.

OPERATING INSTRUCTIONS

N O T I C E

FCC REGULATIONS REQUIRE THAT THE DC INPUT TO THE FINAL BE LIMITED TO 5 WATTS FOR CB OPERATION. REMEMBER, IT IS YOUR RESPONSIBILITY TO SEE THAT THIS FIGURE IS NOT EXCEEDED.

Make sure the transceiver is properly installed for base or mobile operation (as indicated previously), and that the antenna and power source are connected. If you have not already done so, connect the microphone (the receiver will not operate without the microphone connected).

RECEIVING

Place the ANL in OFF position, rotate squelch control to the extreme counter-clockwise position, set meter switch in the "S" position and PA volume in the fully counter-clockwise (CB) position. Select desired channel and rotate volume control to operate the power switch. The "S" meter and channel indicator should light up. The front panel strip should also glow softly. Advance the volume control to about 1/3 setting. As the unit warms up, the characteristic noise (rushing sound) of a high gain receiver should be heard. Adjust volume to a comfortable listening level. The receiver is now ready to operate.

SQUELCH ADJUSTMENT

The Squelch control is used to eliminate annoying background noise when no signals are present. To adjust the SQUELCH control properly during reception, turn up VOLUME until background noise is heard(no signals should be present). Rotate the SQUELCH slowly clockwise until the background noise just disappears. At this point, the receiver will be quiet under "no-signal" conditions, but an incoming signal will overcome the squelch action and be heard. Since this control is variable, it can be used to provide varying degrees of sensitivity to incoming signals. As the control is advanced (from the extreme counter-clockwise position), the squelch action is progressively increased and progressively stronger incoming signals are needed to overcome it. To receive extremely weak signals or to disable the squelch circuit, simply turn the control fully counter-clockwise.

DELTA TUNING

The ▲TUNE control acts as a "fine tuning" control (-2.5 Kc/Normal/+2.5 Kc) and may be used for reception of a station that is slightly off-frequency. Try all positions and select the one that provides best reception and highest "S" meter reading.

ANL

In the presence of ignition or other man-made impulse noise, rotate the ANL control clockwise to switch the limiter into the circuit. As the control is advanced, the noise-reducing action is increased at a slight sacrifice of fidelity. It is up to the operator to choose a setting which provides greatest intelligibility in each situation.

"S" METER

During reception, the "S" meter provides a relative indication of signal strength in "S" units and thus offers a basis for comparison between one incoming signal and another. The S-meter circuit has been pre-adjusted at the factory to indicate "S-9" with 100 microvolts at the antenna input. The following table shows the approximate signal strength required at the antenna to produce readings from 0 to +30 db (at the center of the Citizens Band).

"S" UNITS	MICROVOLTS	"S" UNITS	MICROVOLTS
0	0.3	7	22.5
1	0.63	8	55.5
2	1.25	9	100.0
3	2.0	+10 db	280.0
4	3.15	+20 db	500.0
5	5.0	+30 db	3200.0
6	10.0		

The meter reading may be readjusted by means of a control accessible through a hole in the top of the cabinet (see diagram under Receiver Alignment). Normally, the "S" meter should be set to read "0" with no antenna connected.

PRIVA-COM SOCKET

An 11-pin socket at rear of the transceiver is provided for use with the Lafayette "PRIVA-COM" selective call unit. A jumper plug (with pins 2 & 3 and pins 4 & 5 shorted) is normally inserted into the socket and should be removed only when the selective call unit is used.

TRANSMITTING

WARNING: NEVER PLACE THE TRANSCEIVER IN THE TRANSMIT MODE WITHOUT AN ANTENNA CONNECTED. THIS MAY DESTROY THE RF POWER OUTPUT TUBE.

Before operating the transmitter the following must be done:

1. A valid Class D citizens band equipment license shall be posted at the main control (fixed) station location.
2. A properly filled out and SIGNED mobile identification card 452C must be affixed to the unit.
3. Rules Part 95 must be obtained, read and understood.

VIOLATORS OF ANY OF THE ABOVE ARE SUBJECT TO SEVERE PENALTIES.

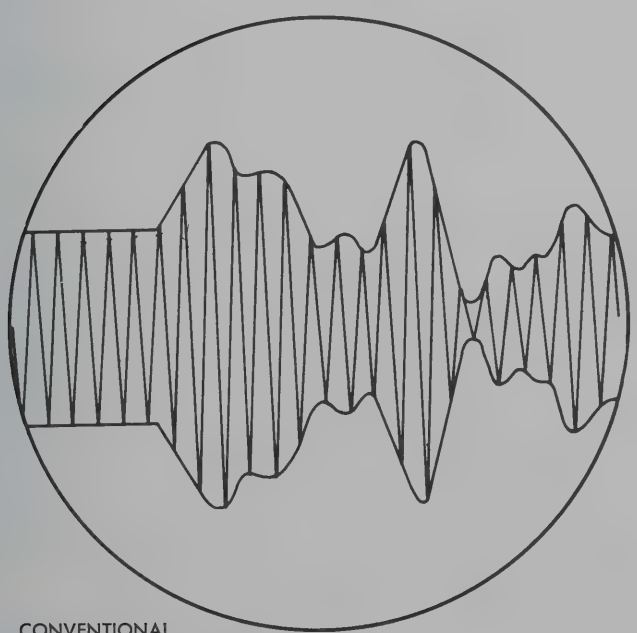
Before attempting to transmit, always make sure that the PA VOLUME control is in the fully counter-clockwise position (CB). Also, check the RF POWER switch at the rear to make sure that it is in the desired position, either 100 milliwatts or 5 watts. To transmit, place the "S/P-RF" position (relative antenna power output is read on the 0-5 scale) and press the microphone button. Hold the microphone at the corner of the mouth so that your voice projects forward (this provides best results) and speak at a normal level. The meter should "flicker" slightly, indicating that you are modulating the RF carrier. During periods of transmission, the receiver is silenced and reception is therefore impossible. In the same way, your signal cannot be heard by another station when they are transmitting. Each must take turns.

NOTE: The RF power meter will read true antenna power output only when the transceiver is connected to a 50-ohm resistive load. If the antenna and transmission line do not offer such a load, the meter readings will not be completely accurate.

RANGE-BOOST

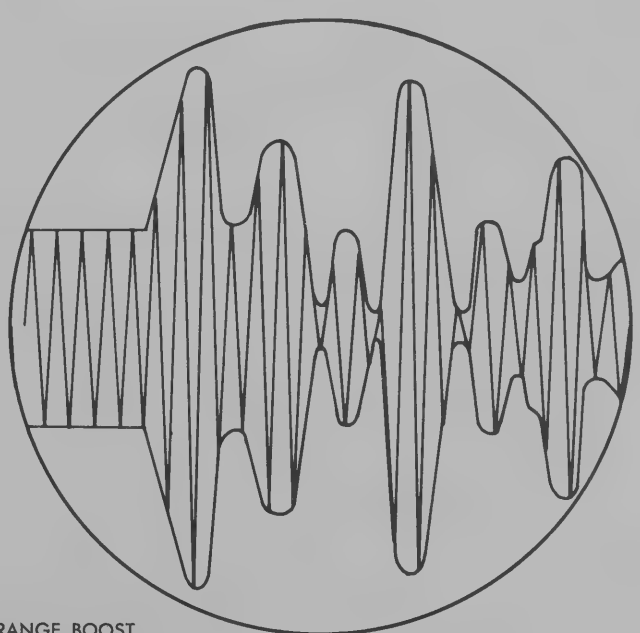
If the station you are attempting to contact reports difficulty in receiving you due to ignition noise, interference, excessive background noise, etc., switch the Range-Boost "on" and speak normally into the microphone. Special circuitry will increase the modulation density in the sidebands and increase the average audio in your signal, permitting it to be heard under conditions which might otherwise make its reception impossible. Never shout or raise your voice when using "Range-Boost" since this will not increase the range of your transmission in any way.

The Range-Boost circuit in this transceiver is of an advanced full-wave design and will introduce no significant distortion in the transmitted audio. As a result, "Range-Boost" may be used as frequently as desired to achieve greater transmitting range.



CONVENTIONAL
Modulation Envelope
(Normal Voice Level)

***Average* depth of modulation as low as 30 or 50%**



RANGE BOOST
Modulation Envelope
(Normal Voice Level)

***Average* depth of modulation is considerably increased—without overmodulating!**

HOW THE RANGE-BOOST SYSTEM WORKS

Normal speech is comprised of components producing a wide range of volume levels. To avoid overmodulation, the transmitter must provide no more than 100% modulation on volume peaks. As a result, some of the softer components may produce as little as 20 or 30% modulation. Under these normally essential conditions, the average modulation may be as low as 30 or 50%, resulting in lower sideband power and reduced communication range of the transmitter. The Range-Boost circuit limits the audio peaks and amplifies the softer components, resulting in a much higher average depth of modulation. This gives increased power in the sidebands with a resultant increase in effective transmitter range.

100 MILLIWATT OPERATION

The transceiver is equipped with a 5W-100MW switch at the rear which, in the 100MW position, will reduce the RF output and permit short-range operation (within buildings, building-to-building, etc.).

PUBLIC ADDRESS OPERATION

Special provision has been made for Public Address (PA) operation, utilizing the microphone and audio stages in the transceiver. For PA operation, rotate the PA VOLUME control clockwise to operate the switch and increase the control setting to about 1/3 initially. Press the push-to-talk button on the microphone and talk into it -- your voice will be heard from the built-in speaker. Connecting an external 4-ohm PA speaker (which may be mounted on the exterior of a car or building) to the PHONES jack, will silence the built-in speaker and allow the operator's voice to be heard over the external PA speaker. Volume can be adjusted by means of the PA VOLUME control. In addition, the RANGE-BOOST circuit may be switched in to provide added gain and clarity to the output.

NOTE: As soon as the microphone push-button is released, the transceiver will return to the normal receive mode to provide CB reception, volume now being determined by the setting of the VOLUME control.

OPERATING PROCEDURES

A Citizens Band station is NOT intended to be a replacement for a ham station. Transmission of a "CQ" (calling any station) to alert any station that might be listening is in violation of Citizens Band Regulations. For information on permissible types of communications, you should always refer to Part 95 of the FCC Rules and Regulations.

When a licensed system consists of several mobile units (cars, boats, etc.), it is common practice to designate the control station by the assigned call letters and arbitrarily assign numbers to the mobile units. An example of a typical exchange might then be as follows:

Station 1..."This is 2W9374, unit one calling unit two mobile."
Station 2..."2W9374 unit one, this is 2W9374 unit two. 10-2 over."
Station 1..."What is your 10-20 unit two?"
Station 2..."10-20 is Elm and Maple Streets."
Station 1..."Proceed to service call at 999 Market Street. 10-4?"
Station 2..."10-4. 2W9374 unit one this is unit two mobile clear."
Station 1..."2W9374 unit one is clear."

For convenience, the National "10-Code" is listed as follows:

GENERAL PROCEDURE

10-1 Receiving poorly
10-2 Signals good
10-3 Stop transmitting--channel in use by others
10-4 OK--affirmative--message received
10-5 Relay message
10-6 Operator busy--stand by
10-7 Out of service
10-8 In service--subject to call
10-9 Repeat transmission--poor reception
10-10 Transmission completed--Subject to call (standing by)
10-11 Speaking too rapidly
10-12 Officials or visitors present
10-13 Advise road and weather conditions
10-14 Correct time
10-15 Make a pickup of..... at.....
10-16 Have picked up or have in possession
10-17 Urgent (business)
10-18 Anything for us
10-19 Nothing for you--return to station
10-20 What is your location?
10-21 Call me by landline
10-22 Report in person to.....
10-23 Stand by
10-24 Finished with last assignment
10-25 Do you have contact with.....
10-26 Disregard last information
10-27 Moving to channel.....

EMERGENCY OR UNUSUAL

10-30 Does not conform to rules and regulations
10-33 Emergency traffic at this station
10-34 Trouble at this station--help needed
10-35 Confidential information
10-36 Accident at.....
10-37 Wrecker needed at.....
10-38 Ambulance needed at.....
10-39 Convoy or escort
10-70 Fire
10-79 Report progress of fire

TECHNICAL

10-91 Too weak--talk closer to mic
10-92 Too loud--talk farther from mic
10-93 Frequency check
10-94 Give a test: J1 with voice--J2 without voice (carrier)

SERVICE AND MAINTENANCE

The HB-444 was carefully designed to provide reliable service over a long period of time. However, in common with all electronic equipment, a component may fail or change characteristics, and thus necessitate replacement of the faulty part. Certain items, such as tubes and pilot lamps, will age and become defective. However, these can be easily replaced by the user if he wishes to do so. More serious failures will usually require the services of a competent licensed technician.

WARNING

FCC REGULATIONS REQUIRE THAT ANY ADJUSTMENTS MADE TO THE TRANSMITTER WHILE ON THE AIR WHICH MIGHT RESULT IN GENERATION OF A SPURIOUS FREQUENCY MUST BE MADE UNDER THE SUPERVISION OF, OR BY, A PERSON HOLDING A VALID FIRST OR SECOND CLASS RADIO TELEPHONE OPERATOR'S LICENSE.

As an aid to the service technician, this manual contains a complete voltage chart, a layout diagram identifying tubes, transformers, coils, etc., a schematic diagram, and a functional block diagram. Also included are instructions for aligning the receiver and transmitter sections.

CABINET REMOVAL

Disconnect power cable and antenna cable. Loosen the four large thumbscrews and remove the support bracket (if attached). Remove the microphone bracket (2 screws). Remove the 7 screws on the underside of the cabinet. Making sure the large knurled thumbscrews are fully loosened, slide the chassis out from the front of the cabinet.

SIMPLE TROUBLE SHOOTING

IMPORTANT: If trouble is experienced with transmission (low RF output, reduced range, etc.), make sure that the 5W-100MW switch at the rear of the transceiver is in the "5W" position.

TUBES

Tubes may be checked in a do-it-yourself tube tester in a neighborhood store, or may be taken to a service shop for testing. Replace any weak or defective tubes with new ones of identical type. Before replacing tubes in the transceiver, refer to the diagram (on a following page) which shows the correct tube locations.

SOLID-STATE DC POWER SUPPLY

The transceiver employs a solid-state (two transistor) power supply for 12 volt DC mobile operation (no vibrator is used). When operated within an input voltage range of 11.5-14.5 volts, the transistors will provide reliable, failure-free operation over a long period of time, with no need for replacement. In the event of transistor failure, the supply voltage in the vehicle should therefore be checked with motor at fast idle. If it exceeds 14.5 volts, the voltage regulator should be adjusted so that this voltage is not exceeded.

PILOT LAMPS

There are three pilot lamps used in the transceiver. Two of these are built into the meter, and the third provides illumination for the channel dial plate. All three are run considerably below their maximum rating and should therefore last almost indefinitely.

FUSES

The 12-volt DC power cable uses an in-line fuse. The value of this fuse is 8 amp. Provision has also been made for fusing the primary circuit during 117 volt AC operation. A 1 amp fuse is located on the rear of the chassis.

In the event of complete failure (tube filaments and pilot lamps not lighting), the fuse should always be checked first. If it has failed, replace only with one of a similar rating. Repeated failure of a fuse would indicate a serious fault in the transceiver which should be investigated.

RECEIVER SQUELCH ADJUSTMENT

The squelch circuit has been factory-adjusted to provide a suitably wide range of action under normal conditions. If the squelch threshold (the point at which the receiver "silences") appears to shift so that extreme clockwise rotation of the control is required to silence the receiver, the circuit may be readjusted to advance the threshold. Switch the transceiver on and, after warm-up, rotate VR4 clockwise with a screwdriver (VR4 can be adjusted through hole in cabinet top) until the threshold point has been advanced sufficiently.

MAXIMUM RF OUTPUT POWER

The transceiver may be peaked for maximum RF power output at the actual installation with the antenna connected. This can be done by peaking L1 for maximum radiated power on an RF field strength meter. Be sure to place the meter at least 30 feet from the antenna to ensure accurate results.

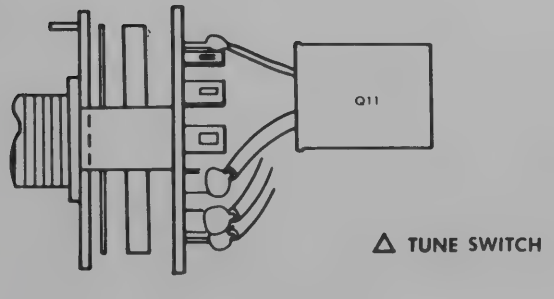
23-CHANNEL CRYSTAL SELECTION SYSTEM

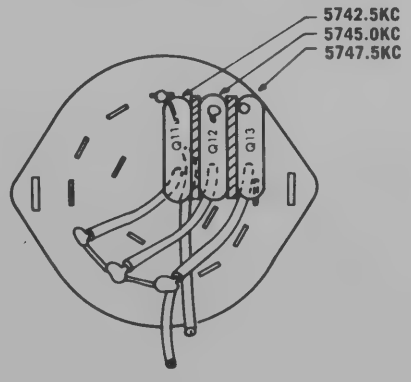
This transceiver employs a method whereby 10 crystals are used in various combinations to produce 23 fundamental oscillator frequencies (see Table A). This arrangement, known as frequency synthesis, permits full 23 channel crystal-controlled operation on both transmit and receive using relatively few crystals. Selection of the proper combinations of crystals in the transceiver is completely automatic in each case, and no special procedures are required by the operator other than the normal operation of a single-control channel selector switch.

TABLE A

U.S. CHANNEL	CHANNEL FREQUENCY	CRYSTALS USED	DERIVED FREQ.*
1	26.965 Mc	Q1 + Q7	33.165
2	26.975 Mc	Q1 + Q8	33.175
3	26.985 Mc	Q1 + Q9	33.185
4	27.005 Mc	Q1 + Q10	33.205
5	27.015 Mc	Q2 + Q7	33.215
6	26.025 Mc	Q2 + Q8	33.225
7	27.035 Mc	Q2 + Q9	33.235
8	27.055 Mc	Q2 + Q10	33.255
9	27.065 Mc	Q3 + Q7	33.265
10	27.075 Mc	Q3 + Q8	33.275
11	27.085 Mc	Q3 + Q9	33.285
12	27.105 Mc	Q3 + Q10	33.305
13	27.115 Mc	Q4 + Q7	33.315
14	27.125 Mc	Q4 + Q8	33.325
15	27.135 Mc	Q4 + Q9	33.335
16	27.155 Mc	Q4 + Q10	33.355
17	27.165 Mc	Q5 + Q7	33.365
18	27.175 Mc	Q5 + Q8	33.375
19	27.185 Mc	Q5 + Q9	33.385
20	27.205 Mc	Q5 + Q10	33.405
21	27.215 Mc	Q6 + Q7	33.415
22	27.225 Mc	Q6 + Q8	33.425
23	27.255 Mc	Q6 + Q10	33.455

* Note that the derived frequency is exactly 6.2 Mc higher than the channel frequency in each case. During transmit, the derived frequency is converted to the channel frequency by the 6.2 Mc crystal oscillator/converter (V11). During receive, the derived frequency is heterodyned with the incoming channel frequency at the 1st Mixer/IF to produce a 1st IF of 6.2 Mc.





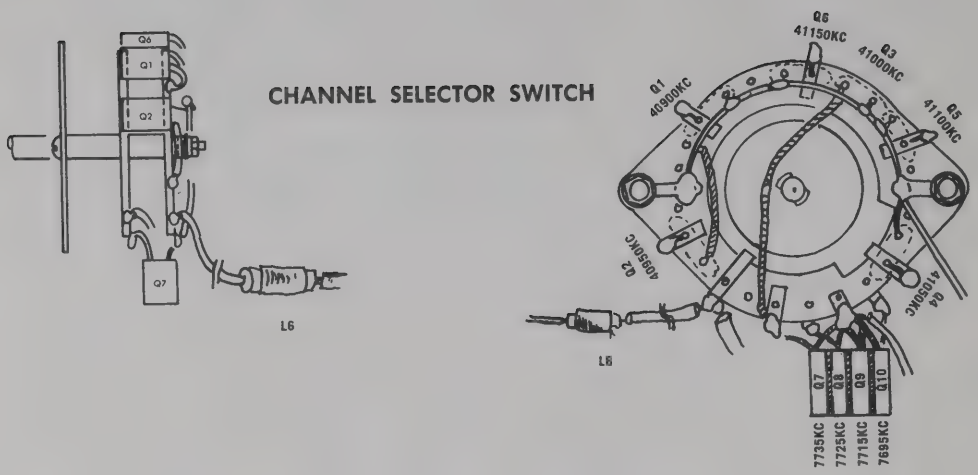


TABLE B

CRYSTAL	FREQUENCY	CHANNELS IN WHICH USED
Q1	40,900 Kc	1 thru 4
Q2	40,950 Kc	5 thru 8
Q3	41,000 Kc	9 thru 12
Q4	41,050 Kc	13 thru 16
Q5	41,100 Kc	17 thru 20
Q6	41,150 Kc	21 thru 23
Q7	7,735 Kc	1, 5, 9, 13, 17, 21
Q8	7,725 Kc	2, 6, 10, 14, 18, 22
Q9	7,715 Kc	3, 7, 11, 15, 19
Q10	7,695 Kc	4, 8, 12, 16, 20, 23

Failure of any one of the ten crystals used will cause a malfunction on a group of channels, as indicated above. For example, failure of crystal Q1 would cause the transceiver to be inoperative on channels 1, 2, 3 and 4; failure of crystal Q7 would cause the transceiver to be inoperative on channels 1, 5, 9, 13, 17 and 21.

NOTE: Q11, Q12, Q13 have been omitted from the tables. These are used in the 2nd oscillator (receiver), and are selected by the Delta Tune switch. Failure of one of the crystals will cause the receiver to be inoperative only when the Delta Tune switch is set to that position which selects the faulty crystal. It is unlikely that all three crystals would fail at the same time.

COMPLETE ALIGNMENT INSTRUCTIONS

The transceiver has been fully aligned at the factory before shipment to you and does not normally require further adjustment. When necessary, however, the receiver and transmitter may be aligned as indicated.

NOTE: All transformer adjustment cores are locked by means of securing nuts. These nuts must be loosened before adjustments can be made. When all alignment is completed, lock all cores by tightening the securing nuts.

RECEIVER ALIGNMENT

455 KC IF ADJUSTMENT

Connect the transceiver to a power source and attach the microphone. Turn volume to its mid-position, squelch and ANL fully counter-clockwise (off), PA Volume in the CB position. Set Delta TUNE to the mid-position (normal) and the CHANNEL selector to channel 13.

Connect an AC voltmeter, having a 2.5 volt scale, across the speaker terminals. Alternatively, the AC meter can be connected to the PHONE jack by means of a phone plug.

Connect a 455 Kc signal generator (modulated 30% at 1 Kc) to pin 7 of V3 (12AT7). Make certain the output frequency of the generator is within 1 Kc of 455 Kc. Increase generator output until the VTVM reads approximately 0.5 volts.

Adjust the top and bottom tuning cores of T3, T4, T5 and T6 for maximum output. Reduce generator output progressively as circuits come into line so that VTVM reading does not exceed about 0.5 volts. When no further increase can be obtained by adjusting the cores, check the frequency of the IF by slowly varying the generator frequency. A maximum output voltage on the VTVM should occur within ±1 Kc of 455 Kc. If not, repeat adjustments until obtained. Disconnect signal generator and proceed with next step.

6.2 MC IF ADJUSTMENT

Connect the signal generator to pin 4 of V2 (6CW4), with the VTVM connected to the speaker terminals. Make sure the Delta Tune switch is in the normal, center position. Tune the generator in the vicinity of 6.2 Mc until the signal is heard in the receiver. Reduce the generator output until the VTVM reads about 0.5 volts. Adjust the top and bottom tuning cores of T2 for maximum reading on VTVM, reducing generator output if necessary, so that reading does not exceed 0.5 volts.

Reduce generator output, and set receiver volume to maximum. Adjust the generator output level until a reading of 1.4 volts is obtained on the VTVM. Normal IF sensitivity is between 5 and 7 μV; if the generator output is 7 μV or less, proceed to the next step. If it is higher, check the IF alignment, tubes or circuitry to determine where the gain is being lost.

SECOND OSCILLATOR

The second oscillator V3b (12AT7) operates at either 5742.5, 5745, or 5747.5 Kc, as chosen by the Delta TUNE switch S4. A normally functioning oscillator will develop approximately -1.5 to -8 volts at pin 2 of V3. Differences in individual crystal activity will cause a variation in grid voltage from crystal to crystal.

LOCAL OSCILLATOR

The master local oscillator, V10b, is used during both transmit and receive. This oscillator operates between 40.900 and 41.150 Mc, as chosen by the channel selector switch. A normally functioning oscillator will develop approximately -1.0 to -5.0 volts at test point 5 on the schematic diagram (use VTVM). Difference in individual crystal activity will cause a variation in the voltage measured at point 5 from crystal to crystal.

The local oscillator is tuned as follows: adjust the bottom core of L2 for maximum negative reading at test point 5 with the channel selector switch set to channel 23, then back off from peak in a counter-clockwise direction (unscrew) to about 70% of the maximum reading. Check all channels for activity. A defective crystal will show up as zero output voltage at test point 5 in four consecutive channels.

SYNTHESIZER

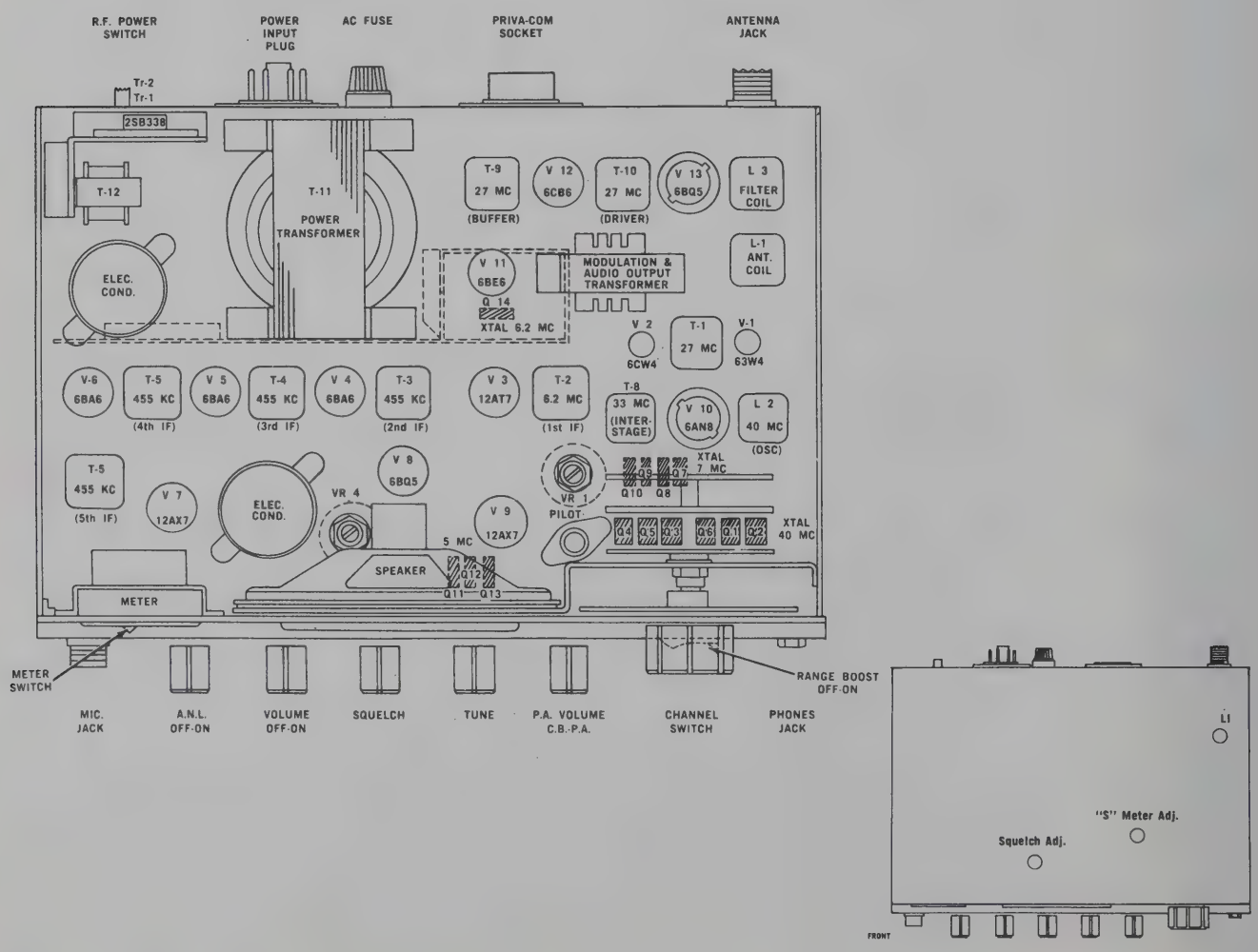
The synthesizer oscillator (V10a) is used during both transmit and receive. This oscillator operates between 7.735 and 7.695 Mc, as chosen by the channel selector switch. A normally operating oscillator will develop approximately -3 to -15 volts at V10 pin 8 (use VTVM) depending on the individual crystal activity. T8 in the output of the Synthesizer V10a is tuned to 33 Mc, this frequency being the difference between the 7 Mc local oscillator frequency and the 40 Mc Synthesizer oscillator frequency.

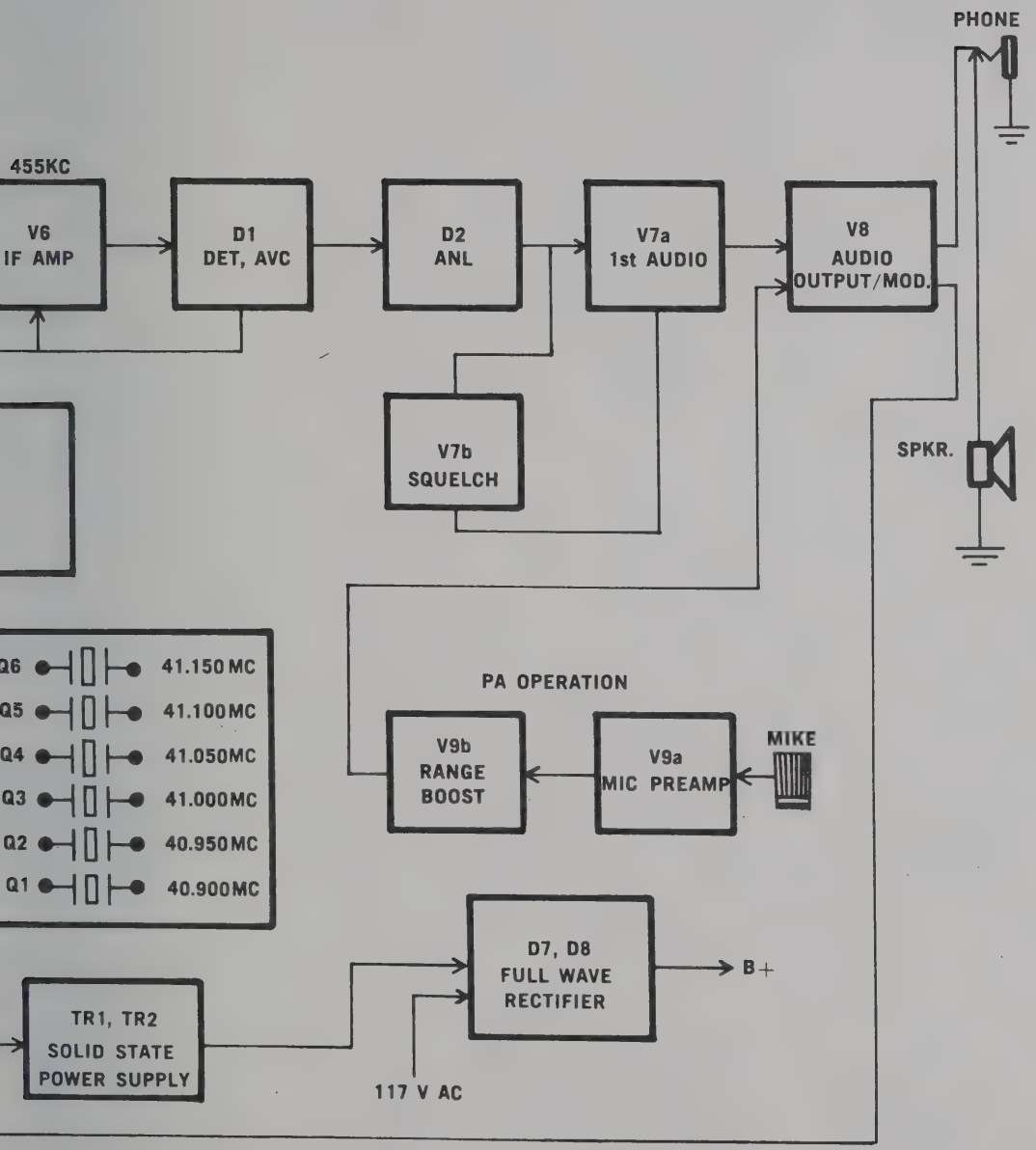
RF ADJUSTMENTS

When it has been ascertained that all oscillators are functioning normally, connect the signal generator (modulated 30% at 1 Kc) to the receiver antenna connector. Use RG58/U or equivalent 52-ohm cable. Set generator output to approximately 10 μV, and switch receiver to channel 13. Tune the generator around 27.115 Mc until a signal is heard in the receiver. Adjust the generator output frequency for maximum output voltage reading on the VTVM (at speaker terminals). Adjust the top and bottom tuning cores of T1 for maximum output.

"S" METER ADJUSTMENT

After receiver alignment has been completed, adjust VR1 for a "S-9" reading on the "S" meter with 100 μV signal input and transceiver set to channel 13.




PHONE
455KC
V6
IF AMP
D1
DET, AVC
D2
ANL
V7a
1st AUDIO
V8
AUDIO
OUTPUT/MOD.
V7b
SQUELCH
SPKR.
Q6
41.150 MC
Q5
41.100 MC
Q4
41.050 MC
Q3
41.000 MC
Q2
40.950 MC
Q1
40.900 MC
PA OPERATION
V9b
RANGE
BOOST
V9a
MIC PREAMP
MIKE
D7, D8
FULL WAVE
RECTIFIER
B+
TR1, TR2
SOLID STATE
POWER SUPPLY
117 V AC

GRAM HB-444

SYNTHESIZER

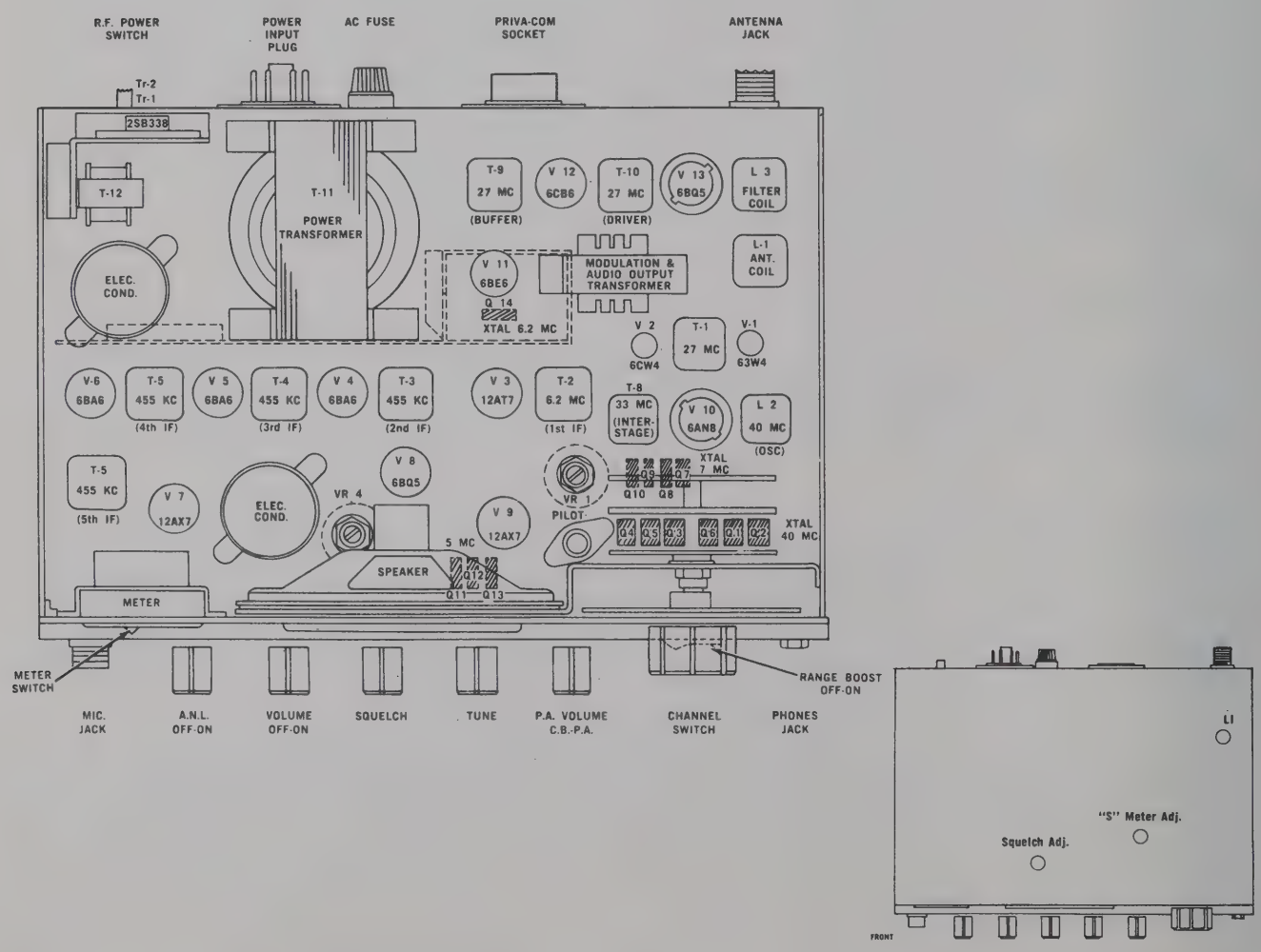
The synthesizer oscillator (V10a) is used during both transmit and receive. This oscillator operates between 7.735 and 7.695 Mc, as chosen by the channel selector switch. A normally operating oscillator will develop approximately -3 to -15 volts at V10 pin 8 (use VTVM) depending on the individual crystal activity. T8 in the output of the Synthesizer V10a is tuned to 33 Mc, this frequency being the difference between the 7 Mc local oscillator frequency and the 40 Mc Synthesizer oscillator frequency.

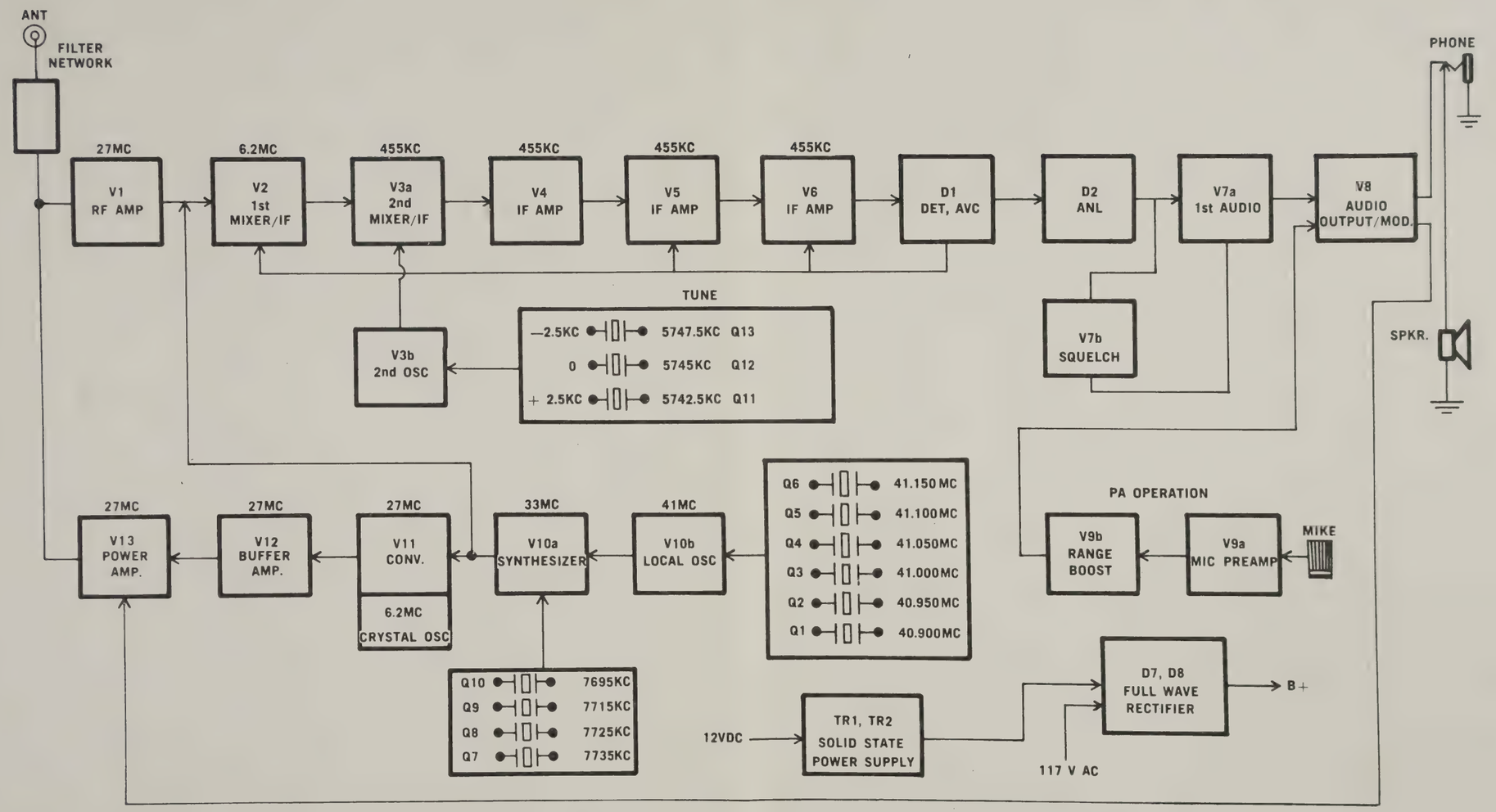
RF ADJUSTMENTS

When it has been ascertained that all oscillators are functioning normally, connect the signal generator (modulated 30% at 1 Kc) to the receiver antenna connector. Use RG58/U or equivalent 52-ohm cable. Set generator output to approximately 10 μV, and switch receiver to channel 13. Tune the generator around 27.115 Mc until a signal is heard in the receiver. Adjust the generator output frequency for maximum output voltage reading on the VTVM (at speaker terminals). Adjust the top and bottom tuning cores of T1 for maximum output.

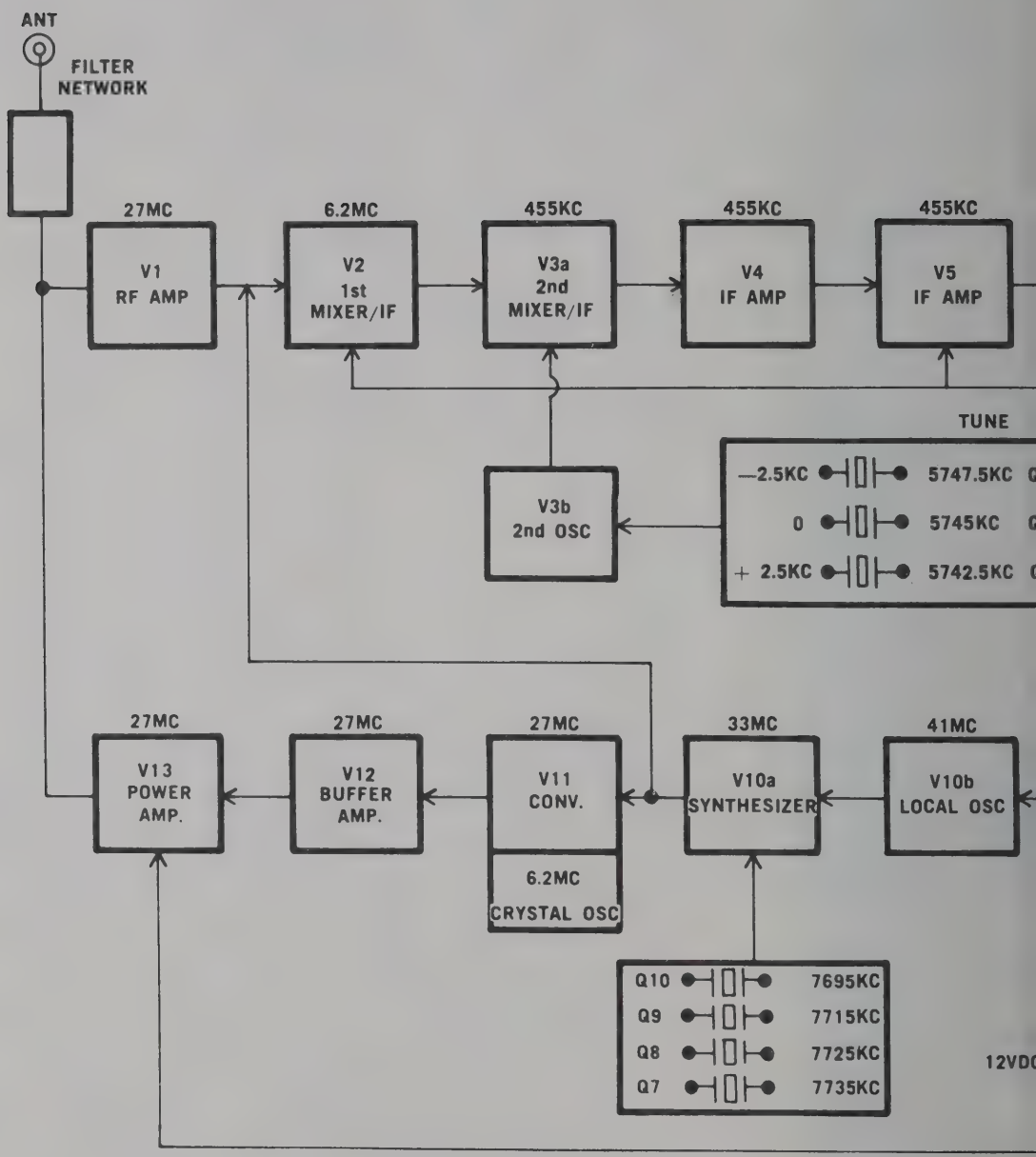
"S" METER ADJUSTMENT

After receiver alignment has been completed, adjust VR1 for a "S-9" reading on the "S" meter with 100 μV signal input and transceiver set to channel 13.





FUNCTIONAL BLOCK DIAGRAM HB-444



FUNCTIONAL BLOCK

TRANSMITTER ALIGNMENT

The detailed operation and alignment of the local oscillator and synthesizer has been covered previously. Both oscillators are used for the transmit operation.

During the receive operation, approximately +50 volts is applied to the plate of V1 and the screens of V4, V5 and V6 to activate the receiver. This same voltage is also applied to the cathode of V9b, V11, V12 and V13, keeping these tubes (which are in the transmitter) cut off. When the mic button is pressed, this same line is grounded and tubes V9b, V11, V12 and V13 are activated to permit operation of the transmitter. At the same time, the plate of V1 and the screens of V4, V5 and V6 are grounded, killing the receiver. The grounding of the plate of V1 removes B+ from this tube, and prevents the possibility of feedback through V1, T1, V11, T9, V12, T10 and V13 during transmit.

NOTE: Connect a 50 dummy load to antenna connector before proceeding (use two 100 ohm 2 watt resistors in parallel).

In order to align the transmitter, connect VTVM to test point 4 and, with mic button pressed, adjust top and bottom cores of T9 for maximum reading on channel 13. A reading of approximately -0.2 volts is normal. Failure to obtain any reading may indicate trouble in the 6.2 Mc converter stage. If the receiver is normal, it is likely that the trouble lies beyond T8, in which case V11 or the 6 Mc crystals should be suspected.
The next step requires the VTVM to be connected to test point 3. Adjust top core of T10 for maximum reading on channel 13. A reading of approximately -12 to -20 volts is normal. At this point, check all channels with an RF wattmeter connected to the antenna connector. Make sure that there is approximately equal power output on all channels. If output is low on some channels, slight readjustment of the top core of T10 for equal reading on channels 1 and 23 will usually ensure adequate output on all 23 channels.

L1 should now be peaked for maximum power output on the RF wattmeter on channel 13. Finally, L3 should be rotated counter-clockwise until the slug is almost fully out. Observing the wattmeter, L3 should now be rotated slowly clockwise until the output just starts to fall. At this point, L3 is correctly set for maximum attenuation of harmonics with minimum effect on the fundamental frequency. L1 may be repeaked at the actual installation with the antenna connected and using an RF field strength meter for an indication of maximum radiated power.

MODULATION

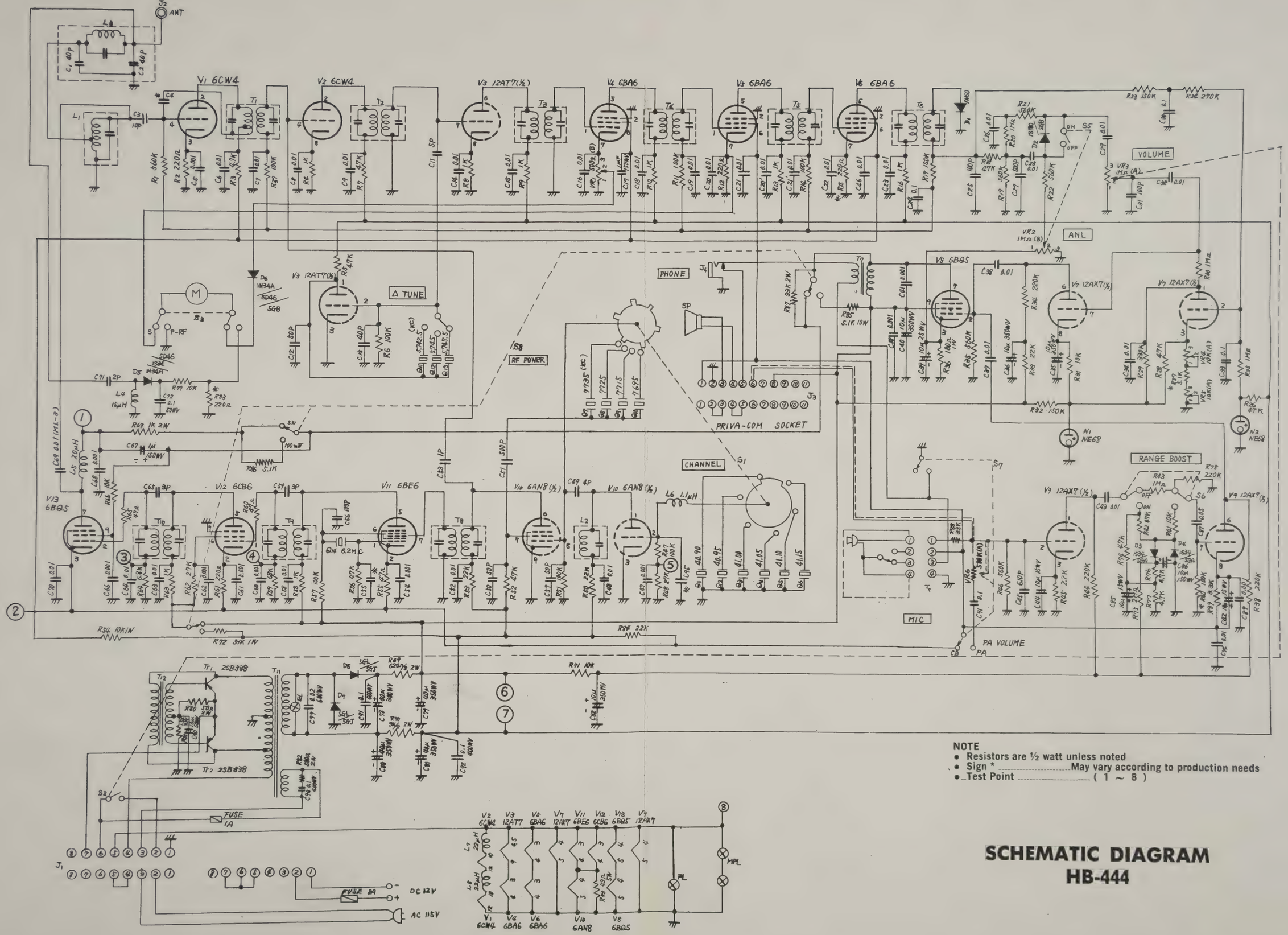
The modulation should be checked by a modulation monitor. The gain is pre-set and should result in 100% modulation with 60 mv of a 1.5 Kc tone applied to pin 1 of the mike jack. With "Range-Boost" switched on, 9 mv should yield 100% modulation. In no case should the unit exceed 100% modulation.

If trouble is experienced with modulation when the Range-Boost is switched on, it may be necessary to re-peak T8, T9, T10 and L1 with a 50 ohm dummy load as follows:

1. Disconnect power cable and antenna cable. Remove the transceiver from the cabinet.

2. Reconnect the power cable.

3. Connect two 100 ohm 2 watt resistors in parallel across the transceiver antenna connector to serve as a 50 ohm load. Do not attempt to use an antenna since this may not present an exact 50 ohm load.



NOTE
- Resistors are ½ watt unless noted
- Sign * ..... May vary according to production needs
- Test Point ..... (1 ~ 8)

SCHEMATIC DIAGRAM
HB-444

TRANSMITTER ALIGNMENT

The detailed operation and alignment of the local oscillator and synthesizer has been covered previously. Both oscillators are used for the transmit operation.

During the receive operation, approximately +50 volts is applied to the plate of V1 and the screens of V4, V5 and V6 to activate the receiver. This same voltage is also applied to the cathode of V9b, V11, V12 and V13, keeping these tubes (which are in the transmitter) cut off. When the mic button is pressed, this same line is grounded and tubes V9b, V11, V12 and V13 are activated to permit operation of the transmitter. At the same time, the plate of V1 and the screens of V4, V5 and V6 are grounded, killing the receiver. The grounding of the plate of V1 removes B+ from this tube, and prevents the possibility of feedback through V1, T1, V11, T9, V12, T10 and V13 during transmit.

NOTE: Connect a 50 dummy load to antenna connector before proceeding (use two 100 ohm 2 watt resistors in parallel).

In order to align the transmitter, connect VTVM to test point 4 and, with mic button pressed, adjust top and bottom cores of T9 for maximum reading on channel 13. A reading of approximately -0.2 volts is normal. Failure to obtain any reading may indicate trouble in the 6.2 Mc converter stage. If the receiver is normal, it is likely that the trouble lies beyond T8, in which case V11 or the 6 Mc crystals should be suspected.
The next step requires the VTVM to be connected to test point 3. Adjust top core of T10 for maximum reading on channel 13. A reading of approximately -12 to -20 volts is normal. At this point, check all channels with an RF wattmeter connected to the antenna connector. Make sure that there is approximately equal power output on all channels. If output is low on some channels, slight readjustment of the top core of T10 for equal reading on channels 1 and 23 will usually ensure adequate output on all 23 channels.

L1 should now be peaked for maximum power output on the RF wattmeter on channel 13. Finally, L3 should be rotated counter-clockwise until the slug is almost fully out. Observing the wattmeter, L3 should now be rotated slowly clockwise until the output just starts to fall. At this point, L3 is correctly set for maximum attenuation of harmonics with minimum effect on the fundamental frequency. L1 may be repeaked at the actual installation with the antenna connected and using an RF field strength meter for an indication of maximum radiated power.

MODULATION

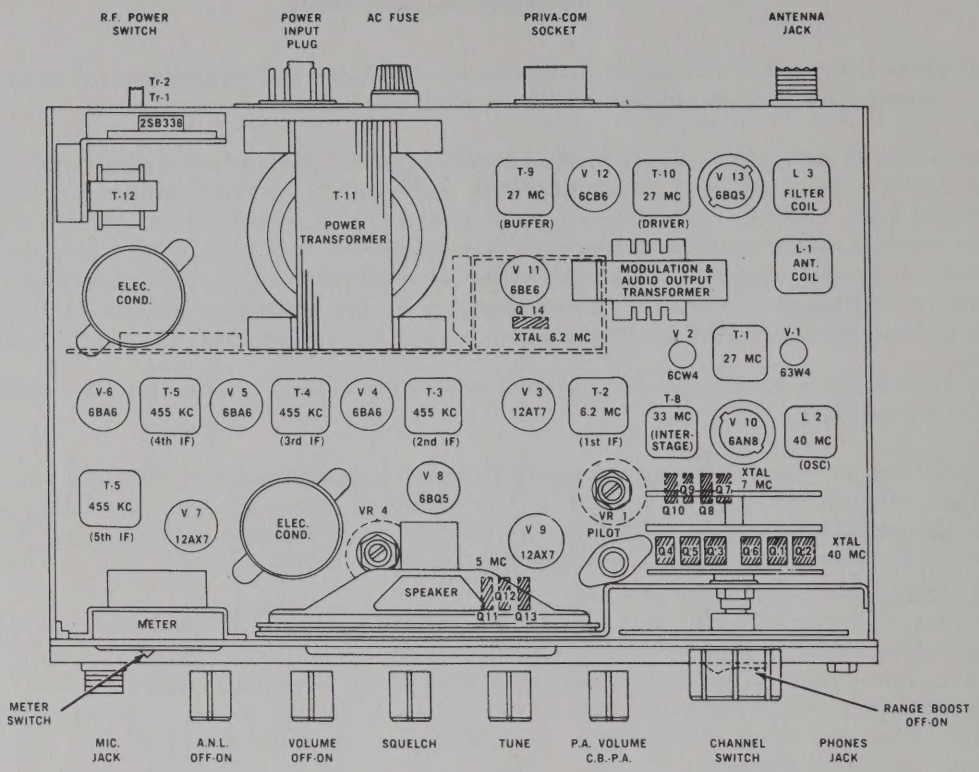
The modulation should be checked by a modulation monitor. The gain is pre-set and should result in 100% modulation with 60 mv of a 1.5 Kc tone applied to pin 1 of the mike jack. With "Range-Boost" switched on, 9 mv should yield 100% modulation. In no case should the unit exceed 100% modulation.

If trouble is experienced with modulation when the Range-Boost is switched on, it may be necessary to re-peak T8, T9, T10 and L1 with a 50 ohm dummy load as follows:

1. Disconnect power cable and antenna cable. Remove the transceiver from the cabinet.

2. Reconnect the power cable.

3. Connect two 100 ohm 2 watt resistors in parallel across the transceiver antenna connector to serve as a 50 ohm load. Do not attempt to use an antenna since this may not present an exact 50 ohm load.



4. Allow the transceiver to warm up for five or ten minutes. Switch the meter switch to "P-RF" and, with microphone button pressed, adjust T8, T9, T10 and L1 for maximum power output indication on the meter.

5. Switch off, disconnect cables and re-insert the transceiver into its cabinet. L1 may require slight re-adjustment at the actual transceiver installation, using a field strength meter.

RETURNING THE UNIT FOR REPAIR

In the event that repair is necessary (either in or out of warranty), we recommend that you return the transceiver to the Lafayette store from which it was purchased. If the unit is to be shipped to our main office for service, please read the instructions which follow.

SHIPPING INSTRUCTIONS

Pack the unit very carefully to avoid damage in transit, preferably in its original carton. If the original carton is not available, use a sturdy carton with at least 3 inches of shredded paper or excelsior around the unit. In the latter case, wrap the unit in paper first to avoid particles of packing material getting into it. Include with the unit a letter explaining exactly what difficulties you have encountered (remember to add an extra 5¢ postage and indicate on the outside of the carton that First Class Mail is enclosed). Ship by prepaid express if possible and mark ELECTRONIC EQUIPMENT -- FRAGILE. Clearly address the carton as follows:

SERVICE DIVISION
LAFAYETTE RADIO ELECTRONICS CORP.
111 JERICHO TURNPIKE
SYOSSET, L. I., N. Y.

VOLTAGE CHART

1. All readings taken with VTVM from chassis (negative) to point indicated.
2. Input to transceiver set at 117 volts AC. Identical readings are obtained with 12 volts DC input.
3. Transceiver set to channel 13.
4. ANL off, VOLUME and SQUELCH at minimum (counter-clockwise) position, Delta TUNE in center (normal) position, METER switch in P-RF position, PA Volume in CB position, Range-Boost off.
5. 50 ohm dummy load connected to antenna connector.
6. Readings on individual units may vary by as much as ±20%.
7. NDV: No detectable voltage.

TUBE	TYPE OF OPERATION	PIN NUMBERS 1	2	3	4	5	6	7	8	9	10	11
V1 6CW4	REC	--	54	--	NDV	--	--	--	0.4	--	H	H
	TR	--	0	--	NDV	--	--	--	0	--	H	H
V2 6CW4	REC	--	54	--	NDV	--	--	--	1.0	--	H	H
	TR	--	70	--	NDV	--	--	--	0.5	--	H	H
V3 12AT7	REC	60	-7.7*	GND	H	H	100	NDV	2.3	H	--	--
	TR	55	-7.0*	GND	H	H	97	NDV	2.35	H	--	--
V4 6BA6	REC	NDV	GND	H	H	100	60	2.0	--	--	--	--
	TR	NDV	GND	H	H	97	0	0	--	--	--	--
V5 6BA6	REC	NDV	GND	H	H	100	60	1.2	--	--	--	--
	TR	-16.5	GND	H	H	97	0	0	--	--	--	--
V6 6BA6	REC	NDV	GND	H	H	100	60	1.2	--	--	--	--
	TR	-16.5	GND	H	H	97	0	0	--	--	--	--
V7 12AX7	REC	60	16	19	H	H	220	52	62	H	--	--
	TR	56	11	18.5	H	H	190	51	60	H	--	--
V8 6BQ5	REC	--	NDV	8.6	H	H	--	265	--	270	--	--
	TR	--	NDV	7.0	H	H	--	205	--	225	--	--
V9 12AX7	REC	150	NDV	1.3	H	H	260	NDV	57	H	--	--
	TR	125	NDV	1.1	H	H	135	NDV	1.15	H	--	--
V10 6AN8	REC	32	-8.8*	GND	H	H	215	80	-3.8*	GND	--	--
	TR	31	-8.0*	GND	H	H	180	73	-3.5*	GND	--	--
V11 6BE6	REC	0	60	H	H	270	270	H	--	--	--	--
	TR	-5	0.15	H	H	225	50	H	--	--	--	--
V12 6CB6	REC	NDV	60	H	H	270	270	GND	--	--	--	--
	TR	-0.32	2.7	H	H	215	165	GND	--	--	--	--
V13 6BQ5	REC	--	NDV	60	H	H	--	265	--	265	--	--
	TR	--	-19.5	GND	H	H	--	158	--	158	--	--

* Readings at this point will vary, depending on crystal activity.

Test Point (on Schematic)	Transmit	Receive
(1)	158V.	265V.
(2)	Ground	60V.
(3)	-24.5	-----
(4)	-0.6	-----
(5)	-2.0	-2.2
(6)	225V.	270V.
(7)	128V.	140V.
(8)	12V. (AC-DC)	12V. (AC-DC)

Power transformer secondary voltage is 110 volts AC under full load.

LAFAYETTE
RADIO ELECTRONICS
CORPORATION

111 JERICHO TURNPIKE
SYOSSET, L. I., NEW YORK

IM-392 8-65 3M-HH